36. *Deer Problem:* The surface area of a deer's body is approximately proportional to the $\frac{2}{3}$ power of the deer's weight. (This is true because the area is proportional to the square of the length and the weight is proportional to the cube of the length.) Suppose that the particular equation for area as a function of weight is given by the power function

$$A(x) = 0.4x^{2/3}$$

where x is the weight in pounds and $A(x)$ is the surface area measured in square feet.

a. Find $A(50)$, $A(100)$, and $A(150)$. Explain the real-world meaning of the answers.

b. True or false: "A deer twice the weight of another deer has a surface area twice that of the other deer." Give numerical evidence to support your answer.

c. Find an equation for $A^{-1}(x)$, where x now stands for area instead of weight.

d. Plot A and A^{-1} on the same screen using function mode. Use a window with $0 \le x \le 250$. How are the two graphs related to the line $y = x$?

37. *Braking Distance Problem:* The length of skid marks, $d(x)$ feet, left by a car braking to a stop is a direct square power function of x, the speed in miles per hour when the brakes were applied. Based on information in the *Texas Drivers Handbook* (2002), $d(x)$ is given approximately by

$$d(x) = 0.057x^2 \qquad \text{for } x \ge 0$$

The graph of this function is shown in Figure 1-5m.

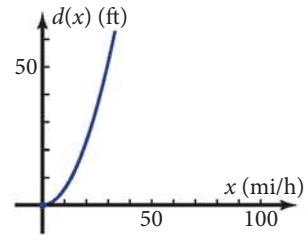

Figure 1-5m

a. When police officers investigate automobile accidents, they use the length of the skid marks to calculate the speed of the car at the time it started to brake. Write an equation for the inverse function, $d^{-1}(x)$, where x is now the length of the skid marks. Explain why you need to take only the positive square root.

b. Find $d^{-1}(200)$. What does this number represent in the context of this problem?

c. Suppose that the domain of function d started at -20 instead of zero. With your grapher in parametric mode, plot the graphs of function d and its inverse relation. Use the window shown in Figure 1-5m with $-20 \le t \le 70$. Sketch the result.

d. Explain why the inverse of function d in part c is not a function. What relationship do you notice between the domain and range of d and its inverse?

38. *Horizontal Line Test Problem:* The vertical line test of Section 1-2, Problem 39, helps you see graphically that a relation is a function if no vertical line crosses the graph more than once. The *horizontal line test* allows you to tell whether a function is invertible. Sketch two graphs, one for an invertible function and one for a non-invertible function, that illustrate this test.

PROPERTY: The Horizontal Line Test

If a horizontal line cuts the graph of a function in more than one place, then the function is not invertible because it is not one-to-one.